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UCSB Researcher Receives Grant to Study Impact of Deepwater Horizon Oil Spill

Uta Passow, a researcher in UC Santa Barbara's Marine Science Institute, spent most of the past year in the Gulf of Mexico analyzing the environmental impact of oil spilled as a result of the Deepwater Horizon disaster in April 2010. Thanks to new funding by the Gulf of Mexico Research Initiative (GRI), her scientific studies will continue for the next three years.

The GRI, created in part with funds from British Petroleum (BP), which owned the Deepwater Horizon rig, recently announced a $112.5 million award to fund eight research consortia in the Gulf for the next three years. These teams will investigate the fate of petroleum in the environment, the impacts of the spill, and the development of new tools and technology for responding to future spills and improving mitigation and restoration.

Passow is part of a consortium led by Raymond Highsmith of the University of Mississippi. The team's assignment will be "Ecosystem Impacts of Oil and Gas Inputs in the Gulf of Mexico," with funding of $22.5 million for three years. Other institutions on the team are University of Southern Mississippi, University of Georgia, Florida State University, Georgia Institute of Technology, Temple University, Oregon State University, Pennsylvania State University, Columbia University, University of Maryland, University of North Carolina at Chapel Hill, University of Texas, and J. Craig

Venter Institute.

Passow arrived at UCSB as a postdoctoral researcher in 1991 and stayed until 2000. She then left to take a research job in Germany for seven years, returning to UCSB in 2009. At UCSB, she has been studying ocean acidification and working on the Gulf oil project. Her expertise is in carbon cycling and the biological pump, a suite of biological processes that transport carbon from the water's surface to the ocean's depths.

"This has become really important because the surface of the ocean stands in equilibrium with the atmosphere, and the ocean takes up about a third of the fossil fuel we've been putting out so far," Passow said. "A fair amount of this carbon, which is high in the surface ocean, gets transferred to depths and is just removed from the atmosphere over a period of hundreds to thousands of years. That's what the biological pump does. It's called a pump because the carbon moves against the gradient. Organisms and particles fall down, and, once they get to the deep ocean, it takes a thousand years for the particles to come back up."

The Deepwater Horizon accident was different from other spills, Passow said, because the oil was leaked at great depths, and then distributed into the water current. Some of it came to the surface, while a large amount wound up in the sediments.

"So the question is, did it go to the sediments directly?" Passow asked. "Did it come up the surface and then go down again? When we saw the pictures, I knew that we had to use sediment traps to hang at depths and see what falls into them as the particles sink."

For the past year, her trap has been sampling sinking particles near the site of the oil spill in the Gulf. This research was funded by a Rapid Response Grant from the National Science Foundation. With the new funding, more traps will be added, so the research area will be widening. "It's a continuation of what we've been doing, and an expansion," Passow said. "What is clear after this accident is we don't really have a clear understanding of what happens to oil when it is released at great depths. It's made up of 10,000 different substances and the distribution is very complex. The goal is to try to understand how it gets distributed in the water, the physics and chemistry of it. Another part is to see how it affects the ecosystems, both in the water column and in the sediment."

The GRI Research Board is an independent body established by BP to administer the company's 10-year, $500 million commitment to independent research into the effects of the Deepwater Horizon incident. Through a series of competitive grant programs, the GRI is investigating the impacts of the oil, dispersed oil, and dispersant on the ecosystems of the Gulf of Mexico and the affected coastal States, in a broad context of improving fundamental understanding of the dynamics of such events and their environmental stresses and public health implications. The GRI also funds research that improves techniques for detecting oil and gas, spill mitigation, and technologies to characterize and remediate spills. Knowledge accrued will be applied to restoration and improvement of the long-term environmental health of the Gulf of Mexico.

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† Middle image: Deployment of the funnel-shaped sediment trap in August 2010, near the site of the oil spill. The trap has been collecting particles sinking down to the seafloor during the past year.

Analysis of this material will tell researchers when and how components like oil, organisms, or marine snow sank.

†† Bottom image: One- to 2-inch long, mucus aggregate formed experimentally to mimic conditions that led to the formation of similar large oily flocks after the spill. Such aggregates are very efficient in transporting

material, including oil, down to the seafloor, but it is not understood when and how they form.

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